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CURRENT SERIAL RECORDS



10 YEARS FROM TODAY

At a national Washington conference in mid-February, farm experts discussed the agricultural outlook for 1970. You'll find their conclusions in the Outlook section of this magazine, beginning on page 4.

Meanwhile, USDA economists took a longer look, to predict some of the changes that might take place in agriculture over the next 10 years.

In general, they foresee the Seventies as a decade of growth for agriculture. As in the Sixties, individual commercial farms will become larger, more valuable, more productive units. Total sales of farms, processors and marketers will be spurred on by expanding population, incomes, and foreign markets.

In more detail, re-examine your farm, your customers, and your markets as they may be in early 1980:

Your Farm. Commercial farms will continue to become larger. You will likely control more acreage in 1980 than today, possibly by renting land. Rental is expected to gain in popularity because it gives a farmer control of more acres without tying up his capital.

Undoubtedly, you will be at the helm of a much bigger farm business. More land, better seed, breeding stock, pest control and machinery will enable you to greatly increase your productivity and sales.

With more land, purchased inputs and equipment, your farm will be worth more than today. You may well be borrowing more, too, to aid in expansion and short term production needs.

As the volume of your business grows, you'll be working more closely with management experts to control costs and optimize efficiency. With bigger sales, you'll make more use of crop reports and other market information in timing your sales.

You will probably find more family farm operators who incorporate. They will do so to borrow more and to help to pass the farm along to the next generation intact.

Important breakthroughs are expected in two areas of farming: hog

production and the labor-intensive tobacco, fruit, and vegetable crops.

As disease problems are brought under better control, hog confinement setups will be more feasible. They will be similar to modern poultry houses, incorporating automated feed systems and waste lagoons.

While farm output increases, labor needs will decline. Farm workers will number 3-3½ million in 1980, compared with 4.6 million in 1969.

Most farm labor is used on tobacco, fruits, and vegetables. If widely used, new tobacco transplanters and harvesters, feeding into bulk curing barns, could reduce labor needs up to 150 million man-hours. However, most allotments under present programs are a fraction of the 40 acres needed for mechanization. Also full mechanization would eventually displace many thousands of workers, creating serious social repercussions.

Further mechanization of fruit and vegetable production is expected. By 1975, fruit and vegetable output will increase around 16 percent. Automation, though, will reduce labor requirements to 12 percent below current levels.

Your Customers. Growth in population and incomes will increase demand for farm products. The Seventies, which began with 204 million Americans, will probably end with 235-240 million.

Economic growth, economists predict, will create a new level of affluence. Measured in terms of gross national product, the economy will be 80-85 percent larger by 1980.

Americans will spend more for food. In 1969, total food spending was \$104

A PREVIEW OF FARMING IN 1980

billion. By 1980, the figure will be 75-80 percent larger, and spending for all farm products will be up by even more.

In spite of these increases, food outlays will represent a smaller share of personal income after taxes than today's 16.5 percent.

Influenced by a higher income, new convenience foods, and a greater leisure time, your customers will continue to change their taste for food. Meals will feature greater use of beef, poultry, and vegetable fats, but less cereal grains, animal fats, eggs, and fresh fruits and vegetables. Cloth and carpet items will be made of less cotton and wool, and more synthetics. Shoes will make greater use of new leather substitutes.

Foreign markets will continue to be of major importance. World population and incomes are increasing. Food and fiber trade is on the upswing. During the Seventies, we will share in the increase, expanding our farm exports.

Increasing grain production in foreign nations will limit further growth in wheat and rice exports.

Exports of feed grains and soybeans are expected to increase the most. Japan and Western Europe will be major customers for these commodities.

Your Markets. Taking into account likely changes in population and income of consumers, and the future of our export markets, USDA economists projected the possible size of demand for specific farm commodities in 1980.

Beef. U.S. demand for beef will grow by a third in the 10 years ahead. Beef consumption in 1980 is projected at 130 pounds per person, 20 pounds higher than today.

Pork. Demand will pace population growth, thus rising about 15 percent by 1980.

Poultry. The fast-expanding poultry market is expected to be 50 percent larger by 1980.

Eggs. Further decline in eggs used per person is in sight. However, total egg output will grow 10 percent by 1980.

Dairy Products. Demand in 1980 will equal the current level. Declining per capita use will be about offset by population growth.

Crops. Crop output will increase one-fourth during the decade, mostly through higher yields. Major gainers will be soybeans, feed grains, citrus crops, and vegetables. Cotton, potato, and noncitrus fruit crops will register smaller gains.

Here are the predictions for specific crops:



Crop	Unit	1969 ¹		1980
		Millions		
Wheat	bushels	1,459	1,470	
Rice	cwt.	91	109	
Feed Grains	tons	174	248	
Soybeans	bushels	1,117	1,500	
Cotton	bales	10	12	
Tobacco	lbs.	1,803	1,930	
Citrus	tons	11	15	
Noncitrus	tons	11	11	
Fruit				
Vegetables and Melons	tons	20.4	26.5	
Potatoes	cwt.	307	330	
Dry Beans, Peas	cwt.	24	27	

¹ Preliminary.



outlook

Digested from outlook reports of the Economic Research Service
Forecasts based on information available through February 1, 1970

FARM CASH RECEIPTS will rise again in 1970, though the increase is likely to be only half last year's \$3 billion gain. Livestock producers should make out best. Although their volume of marketings is slated to increase, slightly stronger consumer demand should push up average prices for livestock and products. Livestock producers could end the year with cash receipts 3 to 5 percent larger than 1969's \$28½ billion. Little change is foreseen in cash receipts from crop marketings, however. Volume may be up, offsetting slightly lower average prices. Total crop receipts in 1970 probably will be near the \$18.9 billion rate of 1969.



REALIZED GROSS farm income, reflecting the cash receipt picture, could show a gain of around \$1½ billion for the year. Direct government payments to producers may be down slightly, but non-money incomes to farmers will be well maintained.



FARM PRODUCTION COSTS, on the rise as usual, could gain enough from 1969's \$38.6 billion to absorb the expected 1970 increase in gross income. Thus realized net income by year's end will likely come close to the \$16 billion of 1969—a level exceeded only twice since World War II.



CREDIT USE is expected to continue its upward course, as farmers step up their use of purchased inputs and spend more for farm enlargement. Interest rates on farm loans are near record highs. Though rates could ease some in second half '70, they'll probably still top early 1969 levels by year's end. Funds for short- and intermediate-term farm loans will be more adequate than funds for long-term loans. Loans will be harder to qualify for. Lenders reportedly will weigh managerial ability and production capacity more heavily than in the past.

CATTLE SLAUGHTER through the first 6 months of the year is expected to run ahead of 1969's first half. Output of fed beef will be up, more than offsetting smaller nonfed steer and heifer slaughter and a possible reduction in cow slaughter.

●

FED CATTLE PRICES may continue strong this winter, despite large marketings. But heavier cattle weights could dampen the price outlook. Weights are already about 3 percent above a year ago and price discounts have appeared for heavy carcasses.

●

FEEDER CATTLE are commanding higher prices than fed cattle of the same quality because of the brisk demand for replacement animals. There's little likelihood this trend will reverse itself soon. In January, Choice 900-1,000-pound steers at Chicago went for about \$29.50 per 100 pounds. That was more than \$2 less than 550-750-pound feeder steers brought at Kansas City 5 months earlier.

●

TURKEY OUTPUT is likely to be way up in 1970 in response to recent high producer prices relative to feed costs. But sharply smaller cold storage holdings will more than offset the expected increase in production during first half '70. Turkey prices are likely to continue above a year earlier but the second half could see some slippage.

●

SOYBEAN MEAL PRICES, at high levels this winter, reflect the prevailing strong demand for protein feeds. Feed requirements are up as a result of favorable livestock and poultry feed/price ratios, more protein consuming animals to be fed, and severe winter weather. But continued crushings at near capacity levels should bring soybean meal supplies and needs into better balance by spring and summer.

●

SOYBEAN DEMAND, if it stays as strong as it is now, points to a 13- to 15-percent boost in total soybean use above last year's level. Good news comes partly from exports, which are running 28 percent ahead of last year. Soviet sunflowerseed oil, a stiff competitor of U.S. soybeans, is not being marketed in expected quantities. Also, world supplies of fish meal and other oils seem uncertain.

●

A RECORD CRUSH may be in store for the soybean crop this year. Processors have been operating at near capacity and September-December crushings totaled about 235 million bushels, up around

35 million from a year earlier. This record output of oil and meal is moving into marketing channels, and crushers' and refiners' stocks remain relatively low.

●

LEANER HOGS, LOWER SLAUGHTER, LESS LARD. Lard production for the current marketing year is estimated at 1.8 billion pounds, down nearly a tenth from last year. Lower output stems from smaller hog slaughter and the continued decline in lard yield per hog.

●

FRUIT SUPPLIES, up in first half of 1970—substantially higher than a year earlier, with most prices lower than last season. Cold storage stocks of major deciduous fruits are sharply above a year earlier, and yearend stocks of most processed fruits ample for market needs.

●

WHEAT PROGRAM, 1970 is virtually the same as in 1969, except that the acreage allotment at 45.5 million acres is 6.1 million smaller. The national average price support loan rate remains at \$1.25 a bushel. Voluntary acreage diversion program for payment, and the marketing certificate payments also are continued.

●

WORLD WHEAT SUPPLIES continue heavy and may increase further, despite more world trade than last year. But world prices have stabilized and are expected to at least hold to current levels.

●

U.S. WHEAT SALES brighten despite an expected rise in carryover again this summer—possibly to a total of 900 million bushels. Disappearance in January-June 1970 is expected to be larger than a year earlier, pointing to stronger prices than the \$1.28 per bushel average farm price a year earlier. Also, "free" (privately held) supplies were down almost 8 percent on January 1.

●

WHEAT EXPORTS slated to rise to about 600 million bushels for 1969/70. The 10-percent advance from a year earlier is based on improved exports to Japan, more competitive U.S. prices, and less competition from Soviet and Australian spring wheats throughout the rest of the year.

●

COTTON EXPORTS likely will not exceed 2½ million bales this marketing year, down a quarter of a million bales from last year's low level. Continuing competition from foreign-grown cotton and manmade substitutes are the main reasons.

MANMADE FIBER producing capacity has expanded in the past few years. Capacity is now at 6.7 billion pounds. An expansion of one-fourth is expected by late 1971. Most of the increase will probably be in noncellulosic fibers, particularly those that compete with cotton. Rayon and acetate capacity may also increase slightly.

●

1969'S COTTON CROP is estimated at 10 million bales, down about 1 million from last year's crop. This runs well below the 1963-67 average of 12½ million bales. Adverse weather and insect damage more than offset an increase in harvested acreage.

STATISTICAL BAROMETER

	1957-59 average	1968	1969—Latest month available	
Farm output, total	100	120	121	Nov.
Crops	100	120	121	Nov.
Livestock	100	118	118	Nov.
Prices received by farmers	100	108	118	Dec.
Prices paid, interest, taxes, wage rates	100	121	129	Dec.
Parity ratio (1910-14 = 100)		74	76	
Consumer price index, all items	100	121.2	131.3	Dec.
Food	100	119.3	129.9	Dec.
U.S. personal income (\$bil.)	321.5	590	2 629.6	Dec.
U.S. expenditures for food (\$bil.)	66	99	2 103.8	Dec.
Percent income spent for food	20.6	16.8	2 16.5	Dec.
Agricultural exports (\$bil.)	4.2	6.2	3 591	Dec.
Agricultural imports (\$bil.)	3.9	5.0	3 489	Dec.
Farm food market basket:¹				
Retail cost	983	1,118	1,214	Dec.
Farm value	388	435	3 497	Dec.
Farmer's share of retail cost	39	39	3 41	Dec.
Realized gross farm income (\$bil.)	36.5	51.1	2 54.6	
Production expenses (\$bil.)	24.9	36.3	2 38.6	
Realized net farm income (\$bil.)	11.6	14.8	2 16	

¹ Average quantities per family and single-person household bought (1960-61) by wage and clerical workers based on Bur. of Labor statistics.

² Annual estimated rate, seasonally adjusted for fourth quarter of 1969.

³ Preliminary.

BACKGROUND ON:

CATTLE AND BEEF PRICES

Beef has a good claim to number 1 standing among the foods. Consumers eat more beef than any other meat and spend a substantial part of their food dollar for it. In increasing number, they seem to look upon beef as a symbol of affluence along with the second car and the color television set.

Being a public favorite has drawbacks along with advantages. Let beef prices jump a nickel or a dime and consumers pay a lot more attention than they do to changes in prices of many other foods.

Last year provided a good example. Sparked by a temporary reduction in supply and by general inflation, cattle prices rose steadily last winter and jumped to a June peak. Choice steers at Chicago reached a monthly average of \$34.20 per 100 pounds.

The drop from the peak was equally fast. By the year's end prices had lost all of the increase.

Retail beef prices followed the rise in cattle, reaching a peak in July when the average for choice beef topped \$1.02 a pound.

But unlike cattle prices, retail beef prices lost only about half of the gain made earlier in the year.

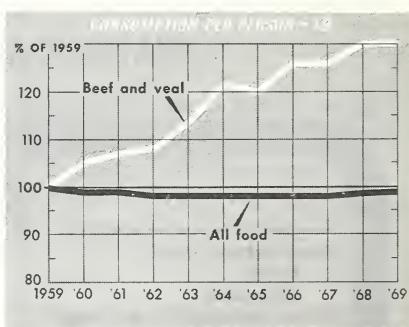
Beef was widely regarded as the chief culprit in last spring's inflationary spurt in the cost of living, even though income and prices generally were going up. The figures clearly show that last spring cattle and beef prices rose more rapidly than most other prices. But in the highly changeable beef market it takes more than one season to make a case. The perspective of time is needed.

THE 10-YEAR RECORD

Producers responded to the rising consumer demand for beef during the 1960's by pushing production up between 4 and 5 percent a year. They were able to do this mainly by increas-

ing the beef calf crop, raising more calves to maturity instead of selling them as vealers, and by putting more animals into feedlots.

One result was a banquet of beef for consumers. Consumption per person rose from 81 pounds to 110 pounds, a rise of 36 percent. Consumption of all food held about steady during the past 10 years.



The rapid rise in beef production during the 1960's put continuing pressure on cattle prices. Average prices to producers trended downward through the first half of the decade and did not reach the 1959 level until 1968. In contrast, prices received by farmers for all products were stable in 1959-64 and in 1969 were 15 percent over 10 years earlier.



Beef prices showed much the same pattern as cattle prices. Retail prices of choice grade were weak during the first half of the decade. In 1969 they averaged 18 percent above the 1959 level, however.

Retail beef prices trailed by a considerable margin the consumer price index—the usual cost of living measure—which rose throughout the 10 years and in 1969 was about 25 percent above a decade earlier.



THE BALANCE SHEET OF AGRICULTURE

ASSETS	Jan. 1, 1969	Jan. 1, 1970
	Billion Dollars	
Physical:		
Real Estate.....	202.6	208.6
Non-real Estate.....	71.8	74.7
Financial.....	23.0	23.8
Total.....	297.4	307.1
CLAIMS		
Real Estate Debt.....	27.1	28.7
Non-real Estate Debt:		
Excluding CCC.....	24.8	26.8
CCC.....	2.7	2.6
Total.....	54.6	58.1
Proprietors' Equities.....	242.8	249.0

The balance sheet of agriculture—similar to the annual statement of a bank—shows the assets and liabilities of the Nation's farming sector.

In general, farmers' financial condition was stronger at the beginning of 1970 than a year earlier. Realized net farm income ran close to the \$16.3 million record of 1966. That's quite a jump from 1968's \$14.7 billion.

Farmers grossed about \$54.5 billion in 1969, up from 1968's \$51.1 billion. Farm production expenses totaled about \$38.5 billion, about \$2.2 billion more than in 1968. Prices advanced for all major inputs, except fertilizer.

Tallying the debits and the credits USDA came up with the following:

Assets: Totaling over \$307 billion on January 1, 1970, assets such as real estate, livestock, and bank deposits were worth 9.7 billion more than they were a year earlier. This 3-percent rise, compared with 5 percent last year, and

6 percent in 1967, evidences softening, and in some areas declines, in farm-land prices, particularly during the last half of 1969.

Claims: On January 1, 1970, farm debt totaled \$55.5 billion (excluding CCC loans), a 6.8-percent increase over a year earlier. This was up from 1968's increase, 6.1 percent. However, during most of the 1960's, farm debt rose almost 10 percent a year.

Loans are down from usual because of the highest interest rates in several decades.

Farmers used a larger than usual part of their earnings and reserves to avoid borrowing at the high rates.

Many life insurance companies withdrew from farm-mortgage investments due to more attractive investments and restrictive usury laws in some States.

Rural banks near urban centers found urban loan markets more attractive than farm markets.



spotlight on south carolina

It was a season-long skid in 1969 for yields in the Nation's cotton fields. South Carolina, though not among the top producing cotton States, nonetheless offers a revealing outline of the 1969 yield plunge.

USDA's Crop Reporting Board on August 1 estimated South Carolina's cotton yield at 443 pounds per acre. By September prospects were down to 411, then slid again to 387 pounds on October 1, and made a further dip to 322 pounds on November 1. December's forecast showed a slight upturn to 343 pounds per acre. A year earlier cotton yields in South Carolina had averaged 352 pounds and in 1967, 449 pounds.

The State's difficulties mirrored the Nation's cotton picture. Coyle H. Whitworth, Georgia-born Statistician-in-Charge of South Carolina's Crop Reporting Service describes the troubles:

"Alternating spells of wet and dry weather and several cold snaps dominated critical parts of the planting and growing seasons."

A dry spell spanned mid-April to mid-May, then several days of rain poured into many of the State's cotton fields. Thus the crop developed erratically in several locations. Root systems deteriorated, soils crusted and solidified, and many acres never fully recovered.

Whitworth noted, "Over 50,000 acres—about 15 percent of originally

seeded cotton acreage—were plowed up because of poor germination, cool weather, seedling diseases and resulting poor stands.

"Cotton abandonment has been abnormally high since 1967; until then it averaged no more than 5 percent."

Cool and wet weather delayed planting in early spring so that only 30 percent of the crop had been planted by late April, compared with 71 percent a year earlier and 62 percent complete for the 1963-67 average.

After a slow start, favorable mid-season weather aided boll development in South Carolina cotton fields. But poor late summer and fall weather kept many bolls from opening.



Coyle Whitworth, Chief Statistician of the South Carolina Crop Reporting Service, examines bolls of cotton hit by late season weather.

Whitworth's job is keeping up with yield and acreage changes in the cotton crop.



Although by mid-season there was better weather for growth, substantial acreage was diverted to other crops such as soybeans.

Whitworth's staff of enumerators in the field and responses by volunteer crop reporters helped statisticians keep pace with the rapidly changing situation.

"Fickle weather," Whitworth notes, "makes for considerable reliance by growers on various crop and weather reports such as the monthly SRS Cotton Report."

SRS reports paced the chaotic weather during 1969, even when a sudden freeze in November took a further toll of the crop in late-maturing fields. This part of the crop had been retarded by heavy vegetation on well-fertilized fields exposed to drenching late-summer rains.

Fortunately, South Carolina's farm economy is flexible.

In the past decade soybeans have expanded and are now planted on

more than a million acres—greater than South Carolina's combined acreage for cotton, corn and tobacco. And, South Carolina farmers are working to develop further alternatives to cotton and perhaps tobacco.

Recently a flax fiber crop was begun in the State's southern farm area. This European-style flax is a quality crop grown for linen textile fabrication, rather than for seed as in the mid-West. A further boost to the State's farm economy comes from another new operation, garden crops such as snap beans for fresh market.

Also on the plus side of the ledger, according to Whitworth, is the crop of peaches that has made the State runner-up to California in peach production for fresh market.

South Carolina's agriculture rings up cash receipts of over \$400 million annually. Generating over a billion dollars for the State's economy, agriculture retains its importance in the face of rapidly advancing industry.

WHAT'S HAPPENED TO COTTON YIELDS?



Soaring crop yields have been the hallmark of U.S. agriculture in recent decades. For example, corn yields in 1950 on a national average were 37 bushels per acre, in 1969 the level was 84 bushels. The trend has been similar, if not quite as dramatic, for many other crops; a steady climb to new marks nearly every year.

Not so for cotton. Although the national average yield exhibited a sharp upward trend in the 50's and early 60's, it apparently topped out in 1965 with a peak of 527 pounds per harvested acre.

The cotton yield picture looks like this.

	<i>Pounds Per Harvested Acre</i>
1950-----	269
1955-----	417
1960-----	446
1965-----	527
1966-----	480
1967-----	447
1968-----	516
1969-----	436

Among reasons for the fluctuating cotton yields, two stand out: weather and skip-row planting. There may be a third. Since 1966, the basic price support loan level and the market price have dropped to near 20 cents a pound, compared with about 30 cents or more in earlier years. This may have

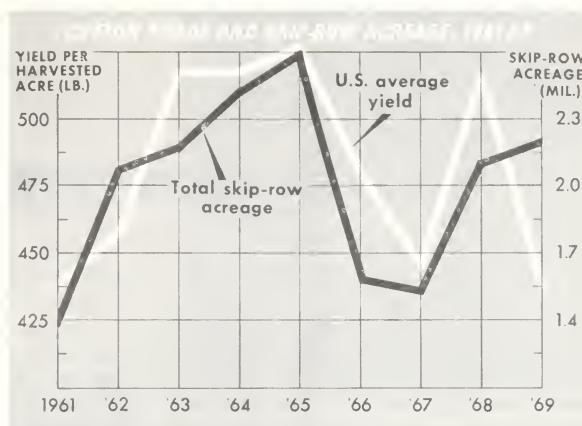
caused farmers to hold back on increasing inputs to boost yields.

WEATHER

The weather wipe-out of 1969 almost obscures all other factors for last year's dip in yields and production. The crop got off to a good start in most areas, but frequent rains caused excessive boll rot, encouraged insect reproduction and partially nullified pesticide effects. Early-season USDA Crop Reporting Board estimates had indicated yields of 504 pounds per acre. When the weather had its way, forecasts were revised downward. Hardest hit were the Texas growing areas which lost an estimated 850,000 bales due to dampness and a freeze. Yields in Texas fell from 410 pounds per acre in 1968 to under 300 pounds last year. Only in the Southeast did yields improve over 1968. The final 1969 U.S. estimate in December was 436 pounds per acre, lowest yield since 1957. National cotton production slumped 8 percent below the 1968 crop despite a 9-percent increase in planted acreage. Production was around 10 million bales.

It would be convenient to blame everything on the weather, but bad growing conditions alone won't explain the general downward trend for yields in the past four years.

The rise and decline of skip row plantings of cotton partially explain the erratic cotton yields of the late 1960's. Correlation was high in all years, except 1969 when weather was the overriding factor.



Skip-Row Planting Patterns

USDA economists indicate skip-row planting practices probably accounted for about one-half the variation in U.S. cotton yields during 1961-69. Since 1961, skip-row acreage has ranged between 1.4 and 2.6 million acres, about 15 percent of the total planted cotton land. National yields normally rise and fall with the changes in skip-row acreage.

By planting in skip-row patterns, producers complying with Government programs are able to spread an acre cotton allotment over two acres or more of land: plant two rows, skip two, or some similar arrangement. While the yield per actual acre of land diminishes, the yield per allotment acre increases significantly. Also, skip-row planting gives plants extra sunshine, moisture, fertilizer, and growing room.

New legislation for cotton changed the acceptance provisions for skip-row acreage for 1966 and 1967. Acreage planted in this fashion declined a million acres from the 1965 level. Yields reflected the adjustment and declined from the top of 527 pounds in 1965 to 480 in 1966 and 447 pounds per acre in 1967. A relaxation of controls for the 1968 crop encouraged about a half-

million acre rise in skip-row acreage. Yields jumped to 516 pounds. There was a further slight increase in skip-row in 1969, but bad weather eliminated any potential yield rise.

Planting in skip-row patterns affects cotton yields to various degrees in each of the four major cotton areas.

Southeast: This section accounts for only 5 percent of total skip-row acreage and the benefits to yields are negligible. Weather, price, and technology probably have much more effect.

Delta: Although this region plants more than five times as much acreage in skip-row patterns as the Southeast, only about one-fourth of the yield fluctuation is explained by it. Price is more significant in the Delta, and weather as well as technology is important.

Southwest: Over half the U.S. skip-row acreage is here, primarily in Texas; however, the practice is more a necessity than a method to raise yields. Producers plant about one-fourth of the cotton acreage in skip-row to take advantage of limited moisture supplies.

West: Here the effect of skip-row acreage shows to best advantage. About 25 percent of the region's acreage is in skip-row patterns. Yields are highest in the country. Skip-row acreage explains about half the variation in cotton yields.

PROTEIN FROM PETROLEUM

Factories and farms don't compete on protein supplements for the livestock feed market yet. But, several methods of manufacturing protein for harvest and eventual use as animal feed are under investigation.

The method closest to realization seems to be the one that replaces soil with oil. The process both upgrades the oil and offers petroleum fractions as a food to grow single celled proteins.

Petroleum in many of the world's oilfields has a high wax content; some as much as 40 percent. These oils cannot be refined because the wax clogs the pipes of refining plants. Removing the wax with micro-organisms may prove cheaper than heat methods, and the micro-organisms may also prove salable as a protein by-product.

In Europe, two pilot plants are in operation; one produces over 200 pounds of protein daily. Reports indicate that the USSR has a 15-ton per day plant in operation. Japan expects to complete a plant soon that will turn out 60,000 tons a year of a feedstuff containing 60 percent protein.

Although factory production of proteins is still in the embryonic stage, fermentation, of course, is a well established commercial practice in the United States. It's already used to produce yeast, vitamins, cheese, alcohol antibiotics, pickles, compost and many other commercial products.

The general steps for growing single celled organisms on petroleum are as follows:

A growth medium is put in a tank. The principal nutrient is a petroleum fraction, into which nitrogen from ammonium salts, phosphorus, potassium, and magnesium salts, such as those found in fertilizer are mixed. Also added are vitamins, water, air, and trace elements.

This brew is then seeded with single celled organisms that will digest the petroleum in food. A principal component of cells produced is protein. Organisms vary in ability to form protein from these mediums, and different species produce protein with different amino acid compositions.

Researchers have had many technical problems in developing the process, even to this stage. Water, oil and air mix poorly. Getting continuous flow systems to work has proved troublesome. Also, finding organisms that give high yields of protein with the right amino acid balance is still under much study.

The single celled organisms feed, grow and breed in the petroleum solution. In one setup, they live on top; in another, oxygen is pumped through the petroleum, allowing the organisms to live throughout the medium.

Cells are harvested either by ladling them off the top or filtering them out of the growing solution. The harvest is washed and dried. The result: a meal-like powder that can be mixed with corn and other feeds. Spokesmen from French and Japanese plants say their product will also be made into products for humans to eat.

Since many of the world's underdeveloped countries lack low-cost, protein-rich foods to feed their people, there has been considerable international interest in single cell protein that has been grown on a petroleum medium. However, extensive research and feeding tests will be necessary before human consumption is likely.

Also, extensive education and promotion would be necessary to overcome buyer resistance. People in underdeveloped countries have never taken well to new foods.

No human consumption of the new proteins has been envisioned for the United States. Producers plan to sell them as protein supplements in feeds for animals such as pigs and chickens.

Even animal feeding of petroleum-grown protein is in the experimental stage. Test feedings on mice, rats, quail, chickens, and pigs have proved successful in Europe. One U.S. oil company has been test-feeding rats and mice, but no results have been made public.

In the feed market, the new proteins will have to compete with already plentiful supplies of soybean meal, urea, and other ingredients on a price and quality comparability basis.



FARM SILO BULLETIN

Are you planning to build a farm silo? Do you want to learn more about their proper construction? "Farm Silos," a 28-page illustrated USDA bulletin, will give you the information you need.

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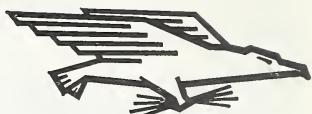
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